New York's Coordinated Research, Development, and Technology Transfer Program

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NEW YORK'S COORDINATED RESEARCH, DEVELOPMENT, AND TECHNOLOGY TRANSFER PROGRAM

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December 1995

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EXECUTIVE SUMMARY

Background and Purpose

NYSDOT has established as one of its goals to advance its role as a national transportation leader through development of innovative, breakthrough ideas in technology and research. Definition of this goal coincided with the Management Systems Bureau's February 1994 assessment of the "critical need for applied research" in every sector of NYSDOT.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) also recognized the role of research, development, and technology transfer (RD&T) activities in creating a "national intermodal transportation system that is economically efficient and environmentally sound" by substantially increasing funding for research, requiring expenditure of 25 percent of each state's annual SPR funds for RD&T activities.

To address NYSDOT's growing research needs and the policy objectives set by state and federal leaders, the Technical Services Division is creating an expanded Department-wide research and technology transfer program. It will provide an organizational focus for existing, but fragmented research activities within NYSDOT. It will systematically define and effectively coordinate the research and technology transfer process in accord with proposed federal requirements. It will provide the capabilities, mechanisms, expertise, and strategies necessary to create an effective, interactive, efficient RD&T process that will help realize NYSDOT's envisioned goals.

The program will manage in-house and contract research activities, and direct the University Transportation Research Center (UTRC) program; monitor the National Cooperative Highway Research Program (NCHRP), Transit Cooperative Research Program (TCRP), and FHWA Pooled-Funds Studies; and provide needed support and coordination for NYSDOT's Intelligent Transportation Systems (ITS) program, FHWA's internal and contract research programs, and the Highway Innovative Technology Evaluation Center (HITEC).

Program Objectives

1. Creation of a nucleus for strategic research planning.
2. Integration of formalized Department-wide strategic thinking.
3. Creation of a cross-functional mechanism for integration/coordination/communication within NYSDOT.
4. Efficient management of all Department-sponsored research through centralization of research management functions.
5. Maximum utilization of research funds and avoidance of unnecessary or unwise investment.
6. Maximum return on the Department's research investments.
7. Compliance with federal regulations concerning program conditions and standards.

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8. Integration of innovative technology into Departmental program planning.

9. Provision of "window" to the outside world of research and technological breakthroughs.

10. Creation of an effective, mutually beneficial relationship with New York State universities.

Program Functions

1. Coordinates all NYSDOT-sponsored research activities.

2. Establishes a system where NYSDOT strategic needs are effectively defined and program priorities are efficiently ranked.

3. Establishes a formal interactive, cooperative process to ensure proper identification and ranking of research needs.

4. Establishes a management control system to monitor research in progress.

5. Uses all funds allocated for research activities efficiently and effectively.

6. Screens all proposed research problems to avoid duplication of effort.

7. Implements an active technology transfer program.

8. Evaluates the effectiveness of the research and technology transfer programs.

9. Maintains an effective working relationship with universities in New York State.

10. Submits to FHWA periodic performance and expenditure reports, and certifications of compliance with standards and conditions set by federal rules.

Program Management

The TR&D Bureau will manage and coordinate this expanded research and technology transfer program, providing a professional program secretariat. Their efforts will be supplemented by the following four new entities:

The Research Executive Board (REB)

This Board will consist of NYSDOT executive-level managers selected by the Commissioner. They will provide policy guidance, approve major program activities, and formulate budgets.

The Research and Development Council (RDC)

This Council will consist of mid-level managers from each functional area within the Main Office, a representative from each of NYSDOT's eleven regional offices, and a chair. Their function will be to ensure identification and ranking of NYSDOT strategic needs.

The Advisory Panel (AP)

This Panel will consist of representatives from FHWA, academia, and private industry, who will be invited to share their input for the RD&T Agenda.

Technical Working Groups (TWGs)

These Groups will be responsible for technical input, such as developing project problem statements and scopes of services, evaluating requests for proposals (RFPs), and implementing research results.

The RD&T Program will define and coordinate research activities currently dispersed throughout the Department. It will implement an active, aggressive technology transfer program, and will accomplish its mission through creation of a management process that will systematically ensure maximum return on the Department's research investments.

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ACRONYMS USED IN THIS DOCUMENT

AP	Advisory Panel
FHWA	Federal Highway Administration
HITEC	Highway Innovative Technology Evaluation Center
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITS	Intelligent Transportation Systems (formerly IVHS, for Intelligent Vehicle Highway Systems)
NCHRP	National Cooperative Highway Research Program
NYSDOT	New York State Department of Transportation
RCG	Research Coordinating Group
RD&T	Research, Development, and Technology Transfer
RDC	Research and Development Council
REB	Research Executive Board
RFP	Request for Proposal
SCOR	AASHTO Standing Committee on Research
SPR	State Planning and Research Program
T2	Technology Transfer
T2 TEAM	Technology Transfer Team
TCRP	Transit Cooperative Research Program
TR&DB	Transportation Research and Development Bureau (formerly Engineering R&D Bureau)
TRIS	Transportation Research Information Services
TWG	Technical Working Group
UTRC	University Transportation Research Center

INTRODUCTION

The 1990s witnessed inception of a new vision for the Department, of an organization steadily advancing its role as a national transportation leader through development of innovative transportation solutions and breakthrough concepts in research and technology. Accomplishing this vision will entail initiation of strategic research activities that not only anticipate, identify, and address potential problems, but also integrate technology advances into the Department's program management, execution, and operation. Emphasis in transportation policy on integration of innovative solutions into overall strategic planning systems is becoming a major theme in the transportation community, because this is considered a crucial ingredient for the new transportation era established by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA).

ISTEA is ending the separation among transportation modes by calling for creation of a "national intermodal transportation system that is economically efficient and environmentally sound." It also recognizes the role of research, development, and technology transfer (RD&T) activities in creating such a system by substantially increasing funding for research, and requiring expenditure of fully one-quarter of each state's annual SPR funding for RD&T activities.

New York's expanded RD&T program will help realize the envisioned state and federal goals, while adapting to the new realities. It will provide an organization focus for existing, but fragmented research activities within the Department. The program will systematically define and effectively coordinate the research and technology transfer process in accord with federal requirements.

Background

ISTEA's provisions have virtually doubled the funds available for research. Federal rule-making has also considerably decentralized RD&T management functions of the Federal Highway Administration (FHWA). It has significantly changed FHWA's role from project-by-project oversight to overall program oversight, thus allowing the states greater authority and flexibility as well as primary responsibility for managing their RD&T activities that are supported by FHWA funds for State Planning and Research (SPR). However, the states must meet certain program standards and conditions before grant approval, including creation of an interactive process for ranking projects, maximum utilization of SPR funds, documentation/implementation of research results, periodic evaluation of program performance, and effective program management.

In response to ISTEA and subsequent federal regulations, the Transportation Research and Development Bureau (TR&DB) has been asked to expand its mission from solely the conduct of engineering research to review and coordination of <u>all</u> Department-sponsored research. This expansion is deemed imperative in establishing a formally structured, comprehensive, Department-wide RD&T program to manage in-house and contract research activities; to direct Department-sponsored activities of the University Transportation Research Center (UTRC), to monitor and participate in the National Cooperative Highway Research Program (NCHRP), the Transit Cooperative Research Program (TCRP) and the FHWA Pooled-funds Program; to support the Intelligent Transportation Systems (ITS) "New York Moves" program; and to provide coordination with FHWA's Contract Research Program and Highway Innovative Technology Evaluation Center (HITEC).

The RD&T Program is designed to address these growing research and technology transfer needs. Managed and coordinated by TR&DB, the program will focus on a variety of transportation research fields, including infrastructure, environment, planning, policy, intermodal transportation systems, innovative technology, administration and productivity. The program will be structured and governed according to the procedures described here.

Need and Purpose

In 1994, the NYSDOT Management Systems Bureau* observed that "there is a critical need for applied research in NYSDOT .... Every sector has expressed the need for applied research at one time for another." The RD&T program outlined here will address this basic Department operational need, as well as broad policy objectives set by state and federal agencies. It will provide the focal point to define and coordinate research activities now dispersed throughout the Department. It will bring together the capabilities, mechanisms, expertise, and strategies necessary to create an effective, efficient, interactive RD&T process that adequately addresses all existing and anticipated needs. In December 1994, NYSDOT management approved the principles and details of the RD&T organization outlined here.

Program Operational Objectives

1. Creation of a nucleus for strategic research planning.
2. Integration of formalized Department-wide strategic thinking.
3. Creation of a cross-functional mechanism for integration/coordination/communication within the Department.
4. Efficient management of all Department-sponsored research through centralization of research management functions.
5. Maximum utilization of research funds.
6. Maximum return on the Department's research investments.
7. Compliance with federal regulations concerning program conditions and standards.
8. Integration of innovative technology into Department program management and execution.
9. Establishment of a "window" to the outside world of research and technological breakthroughs.
10. Creation of a effective, mutually beneficial relationship with universities throughout the state.

Program Functions

1. Coordinates all Department-sponsored research activities, including federally, cooperatively, and state funded in-house and external research activities Figure 1 shows the components of the proposed RD&T initiative, integrating all existing activities into a single annual program.

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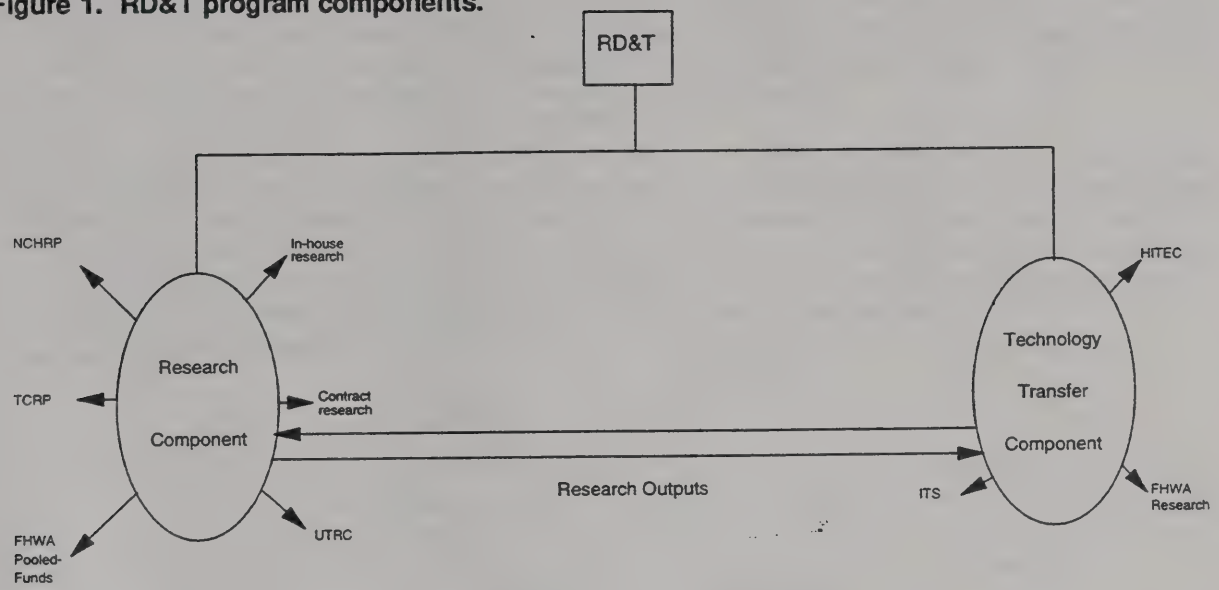
*The Impact of IVHS on the Structure of the Traffic Engineering and Safety Division. Management Systems Bureau, February 1994, p. 29.

Figure 1. RD&T program components.



2. Establishes a system where Department strategic research needs are effectively defined and program priorities are efficiently determined. Assesses compatibility with overall goals and objectives of the Department and the state. Undertakes a well balanced research program that includes a wide variety of research problems (in both hard and soft areas of research).

3. Creates a formal, interactive, cooperative process to ensure comprehensiveness and responsiveness of the research program. This will be accomplished by involving all the Department's operational elements, including top- and mid-level management. In fact, this unique program allows each Department employee to play a role in setting the RD&T program agenda. It will establish customer-oriented strong mutually beneficial relationships between the Department and universities throughout the state. It will strengthen avenues of communication with FHWA and private industry.

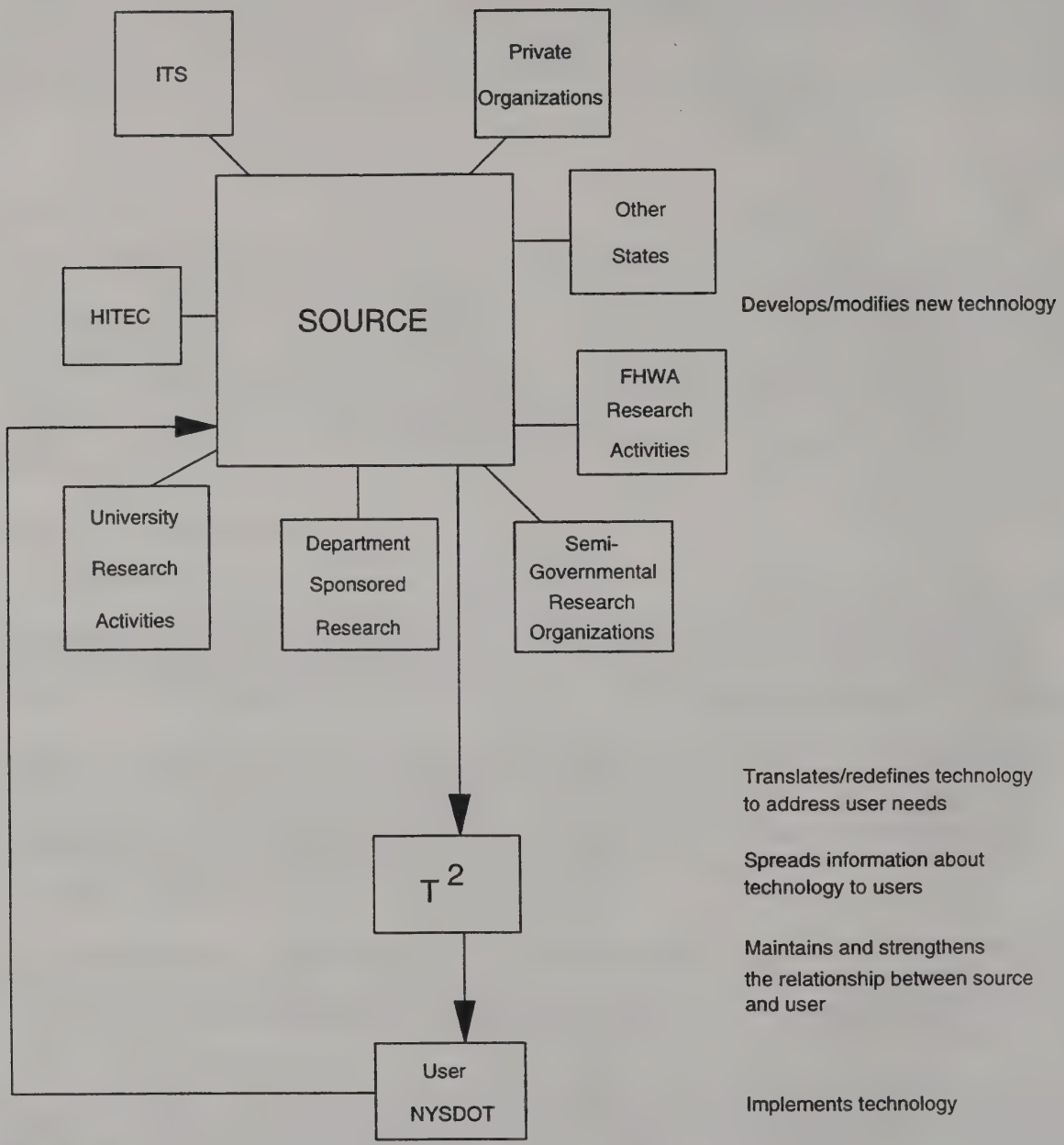
4. Monitors conduct of research through a management control system tracking program activities, schedules, accomplishments, fiscal commitments, project progress and costs, etc. Maintains communications between researchers and potential users to ensure that needs are addressed, that sound scientific methods are used, and that findings are credible and acceptable for operational use.

5. Locates, evaluates, and continuously monitors funding sources and ensures proper allocation and maximum utilization of those funds, either internally or through participation in national, regional, pooled, or cooperatively funded studies. The program will fully utilize in-house research capabilities, as well as existing outside research programs: UTRC, NCHRP, TCRP, FHWA Pooled-Funds, and USDOT's Contract Research Program.

6. Screens proposed research problems efficiently to avoid duplication of effort. Provides for final research reports that document the data collected, analyses performed, and the resulting conclusions and recommendations.

7. Ensures that the Department receives maximum benefits from its research activities, through facilitating adoption of research outputs. This will be achieved through an active technology transfer program that includes a) identifying and evaluating products emerging from research efforts sponsored by the Department, b) refining and packaging of innovative technology, and c) ensuring timely use and adoption of innovative technology through effective delivery systems, such as issuing reports, manuals, etc.; conducting technical courses, presentations, and seminars; and providing one-on-one assistance and technical consultations for appropriate personnel.

Figure 2. T2 program functions.



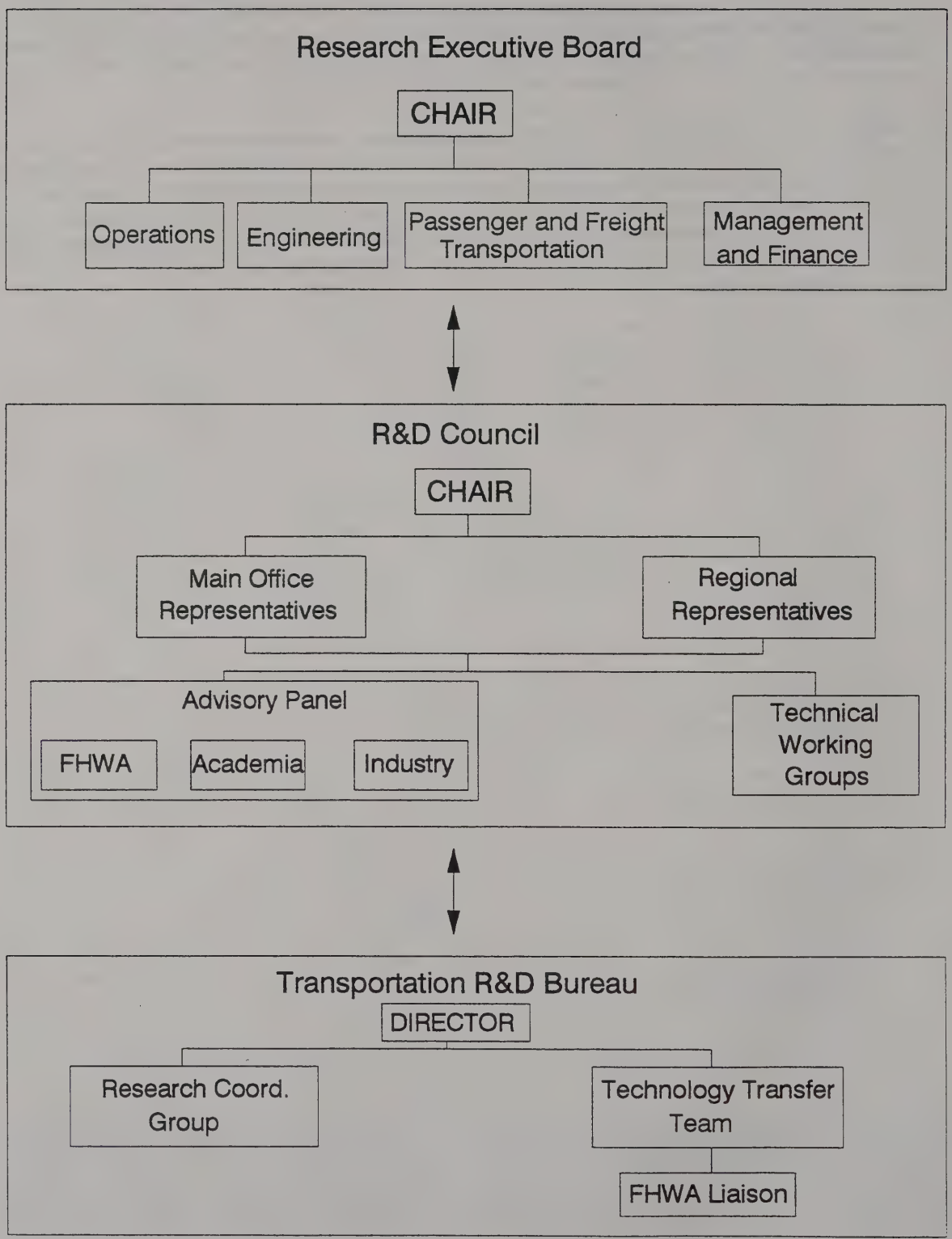
8. Analyzes and documents accomplishments, effectiveness, and efficiencies of RD&T activities. Establishes a mechanism for periodic evaluation to assess the program's effectiveness in meeting identified goals and objectives. This will be done through surveys of user perceptions, feedback from various operational levels, and a tracking system to determine which RD&T products have been adopted for operational use within the state. The purpose of this evaluation is to determine benefits and successes of the RD&T program, and to help update, revise, and improve the program.

9. Strengthens the links between NYSDOT and national governmental, non-governmental, and university-related research activities. Monitors on-going, developing, and completed research conducted by others and reports such

information to NYSDOT employees through regular newsletters geared to their needs. The program thus will provide a "window" through which NYSDOT will be informed regularly of the latest technologies, procedures, and policies endorsed by the transportation community around the nation. Figure 2 shows the role of technology transfer activities as a new link between sources and users of technology.

10. Submits to FHWA periodic performance and expenditure reports including comparison of actual performance with established goals. Specific measures of performance will be established for each operational goal. Quantitative as well as qualitative program benefits will be documented and analyzed. Reports will include progress in meeting schedules, status of expenditures (including comparison of budgeted amounts and actual costs incurred), cost overruns or underruns, approved work program revisions, and supporting data. This information will be made available as advised by FHWA for peer-review purposes.

Figure 3. RD&T organizational structure.



ORGANIZATIONAL STRUCTURE

Figure 3 shows the organizational structure of players involved in the RD&T program, and Table 1 gives detailed descriptions of each player's role in the RD&T process. These players will coordinate program formulation and execution.

Research Executive Board (REB)

The Board will consist of executive-level managers selected at the Commissioner's discretion. They will include Assistant Commissioners who serve as functional managers, and may include any other executive-level managers. Given current Departmental organization, REB will include the Offices of Operations, Engineering, Passenger and Freight Transportation, and Management and Finance. Members selected by the Commissioner may appoint proxies to represent them for REB meetings and other business. REB will provide program guidance by identifying research emphasis areas, approving major program activities, and formulating budgets.

Research and Development Council (R&DC)

This Council will consist of mid-level managers from each of the following functional areas within the Main Office: Operations, Engineering, Passenger and Freight Transportation, and Management and Finance, and a representative for each of NYSDOT's eleven regional offices. They will operate under guidance of the TR&DB Director as permanent chair, representing the Office of Engineering. RDC members will serve three-year terms, and be subject to reappointment or replacement at the option of the REB. Emphasis will be on maintaining a well-balanced RDC with members truly voicing the state's grassroots needs, fostering greater coordination between the NYSDOT regions and Main Office. REB's function will be to identify and rank NYSDOT's strategic needs and formulate the annual RD&T program.

Advisory Panel (AP)

The Panel will consist of representatives from FHWA, academia, and industry serving as non-voting, ex-officio RDC members. They will be invited annually by TR&DB to share their input into the RD&T Program agenda, to advise on program content, and to evaluate program performance.

Technical Working Groups (TWGs)

RDC will appoint members of these groups, who will provide technical input such as development of problem statements and scopes-of-services for proposed projects. Each TWG will be responsible for one of the emphasis areas identified by REB. They will be nominated based on expertise directly relevant to the proposed research. Members will be expected to serve throughout the life of the study, and to participate in implementation of results as advised by TR&DB's T2 Team. Numbers of members in each TWG will vary, depending on need.

Transportation Research and Development Bureau (TR&DB)

This Bureau will manage and coordinate the expanded research program, including all Department-sponsored research. It is deemed the most suitable organization to coordinate this program because of its past and continuing, key role in the conduct and implementation of numerous engineering research studies. Organized in 1958 as the "Bureau of Physical Research" of the former New York State Department of Public Works, it was renamed the "Engineering Research and Development Bureau" when the agency became the New York State Department of

Table 1. Responsilities and authorities in the RD&T process.

1. RESEARCH EXECUTIVE BOARD

FUNCTIONAL AREA	DUTIES
A. CHAIR	
Oversees Board's functions	Presides over REB meetings, directs REB's activities, and calls meetings as necessary to update members on procedural or technical matters.
B. MEMBERS	
Provide program guidance	Develop research emphasis areas providing broad program guidelines and serving as general criteria for project selection. These areas reflect REB's perception of strategic issues facing NYSDOT.
Formulate budget	Develop an annual revenue and expenditure budget for the RD&T program, and approve expenditure plan for each program area.
Approve RD&T program	Ensure that selected projects are consistent with objectives of the NYSDOT operational plan.
Evaluate program performance	Serve as oversight entity ensuring implementation of overall program goals; review and comment on effectiveness of the program, and recommend changes/modifications as necessary.

2. RESEARCH & DEVELOPMENT COUNCIL

FUNCTIONAL AREA	DUTIES
A. CHAIR	
Oversees Council's functions	Calls and presides over RDC meetings, as necessary, to update members on procedural and technical matters, and submits a proposed consolidated program agenda to REB annually on behalf of RDC.
B. MEMBERS	
Identify strategic needs	Through collective and individual brainstorming, identify NYSDOT's strategic research needs in accord with REB.
Formulate program content	Rank high-priority projects and recommend a consolidated program agenda to REB.
Assign candidate projects to programs	Upon REB's approval of each program area preliminary agenda, assign projects to each program.
Appoint TWGs	Appoint TWG members for each emphasis area.

3. RESEARCH ADVISORY PANEL

FUNCTIONAL AREA	DUTIES
Advises on strategic needs	Advises on local and regional stategic needs through responding to surveys conducid by TR&DB staff, and participates in RDC brainstorming sessions.
Advises on research activities	Supports and reinforces RDC functions and acts as advisory expert panel on an as-needed basis. Members serve as non-voting observers to ensure that program formulation is consistent with broad policy direction.

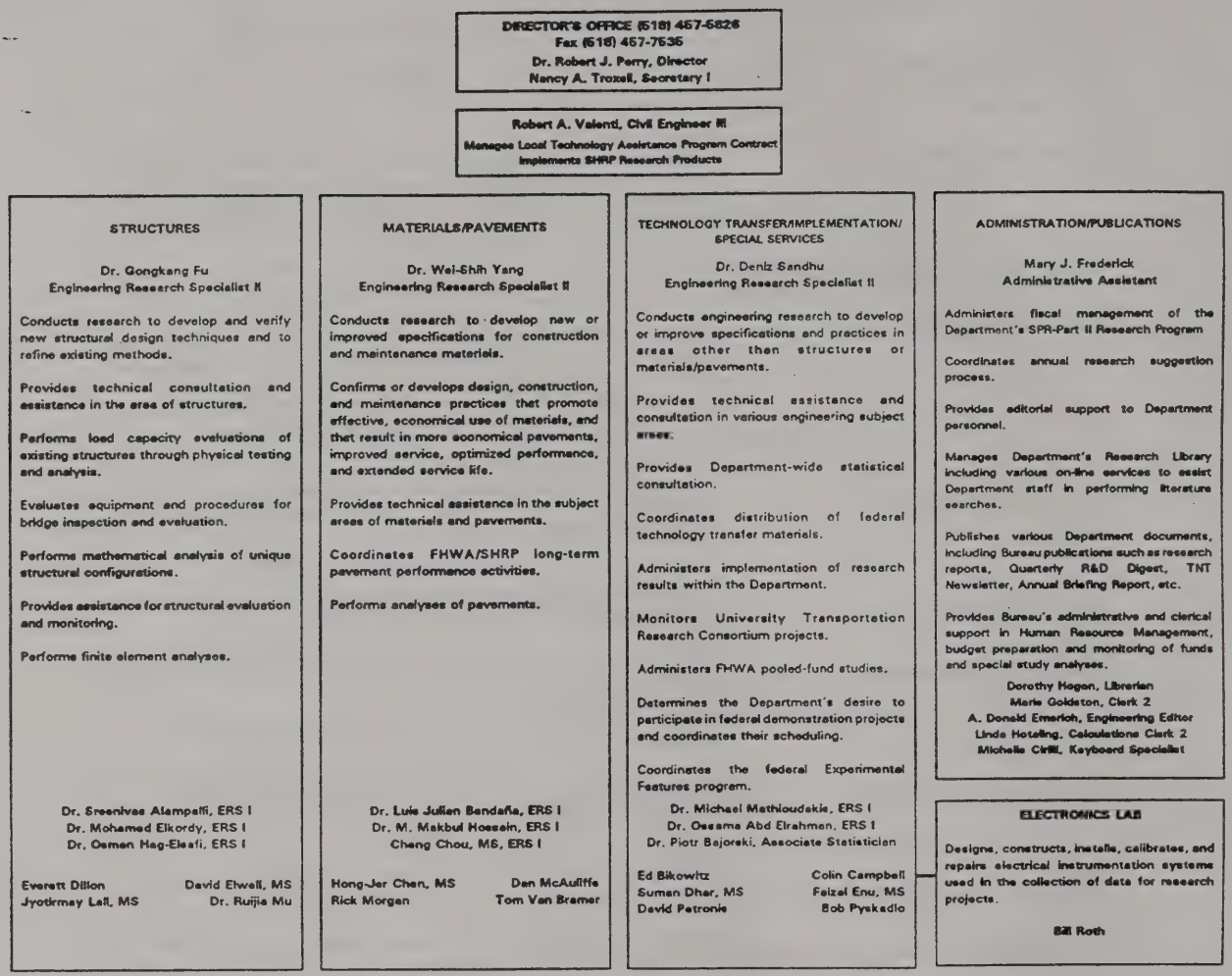
4. TECHNICAL WORKING GROUPS

FUNCTIONAL AREA	DUTIES
Prepare technical documents	In coordination with TR&DB, develop technical documents (first- and second-stage problem statements and/or RFPs for selected projects)
Evaluate proposals	Evaluate project proposals and participate in selectilng contractors from agencies submitting proposals.
Serve as project managers	A manager designated for each project advises on project specifics, describes NYSDOT's objectives to the researchers, clarifies any ambiguities, reviews progress reports, and evaluates final reports. Manager serves as primary contact person within NYSDOT.
Participate in technology transfer	Participate on an as-needed basis in technology transfer activities, particularly in conducting technical presentations and training courses to facilitate application of research outputs.

5. TRANSPORTATION RESEARCH & DEVELOPMENT BUREAU

FUNCTIONAL AREA	DUTIES
A. DIRECTOR	
Directs program functions	Administers the RD&T program; oversees all program activities; ensures that all program procedures and administration are carried out effectively; ensures the technical quality of final products; coordinates program activities; appoints members of the Advisory Panel; acts as principal staff-level liaison among players involved in the RD&T process.
B. RESEARCH COORDINATING GROUP	
Acts as day-to-day interface among program participants	Maintains regular contacts with players involved in the process; provides liaison between REB, RDC, AP, and TWG; records and reports all business presented and acted upon by RDC and REB; reports to REB and RDC any recommendations for change within the program or on other matters requiring their attention, and arranges REB, RDC, and AP meetings.
Coordinates program functions	Coordinates the various segments of the RD&T program; integrates the functions of ECPC, RDC, AP, and TWGs; and develops a systematic mechanism through which an effective R&D process is executed.
Solicits research needs	Solicits research suggestions from NYSDOT personnel and surveys strategic issues facing NYSDOT from RDC, AP, and REB
Screens research suggestions	Conducts preliminary screening of research problems and classifies candidate problems.
Develops problem statements	In coordination with the TWGs, develops first- and second-stage problem statements, and conducts literature reviews.
Prepares Request For Proposals	Develops Request For Proposals (RFPs) for selected projects, and coordinates with Contract Management Bureau and designated proposal selection committees to ensure an efficient proposal evaluation process.
Provides surveillance of research in progress.	Provides administrative and technical surveillance, guidance, and counsel for research in progress.
Provides acceptance reviews of project reports	Issues a semiannual progress report, monitors progress schedule during the research, and evaluates final reports.
Develops analytical tools	Performs analysis to assess program effectiveness in meeting identified goals and objectives.
C. TECHNOLOGY TRANSER TEAM	
Implements T^2 tasks.	Implements tasks of the technology transfer component pertaining to ITS, HITEC, and FHWA internal and contract research programs.
Disseminates research results	Evaluates products emerging from NYSDOT-sponsored research, refines and packages research outputs, edits and publishes reports emanating from the program documenting research results; and distributes reports to affected NYSDOT program areas.
Ensures timely,widespread use of technology	In coordination with TWG and FHWA representatives, conducts an aggressive technology transfer program to promote application of research results. Technical presentations, training courses, and one-on-one consultations are examples of delivery systems used to facilitate application of research output.
Reports on research elsewhere	Monitors research activities conducted elsewhere through a systematic scanning process, publishes the TNT quarterly newsletter documenting internal and external research activities, particularly those sponsored by state DOTs.
Prepares annual certification	Submits annual certification to FHWA demonstrating that the program has followed the conditions for grant approval specified in the rulemaking, and prepares performance reports for FHWA as necessary.
Evaluates overall technology transfer program	Analyzes, evaluates, and obtains feedback from users on overall program performance and reports on effectiveness in meeting goals.

Figure 4. TR&DB organization.



Transportation, and finally became the Transportation Research and Development Bureau in 1994 with inception of the RD&T Program.

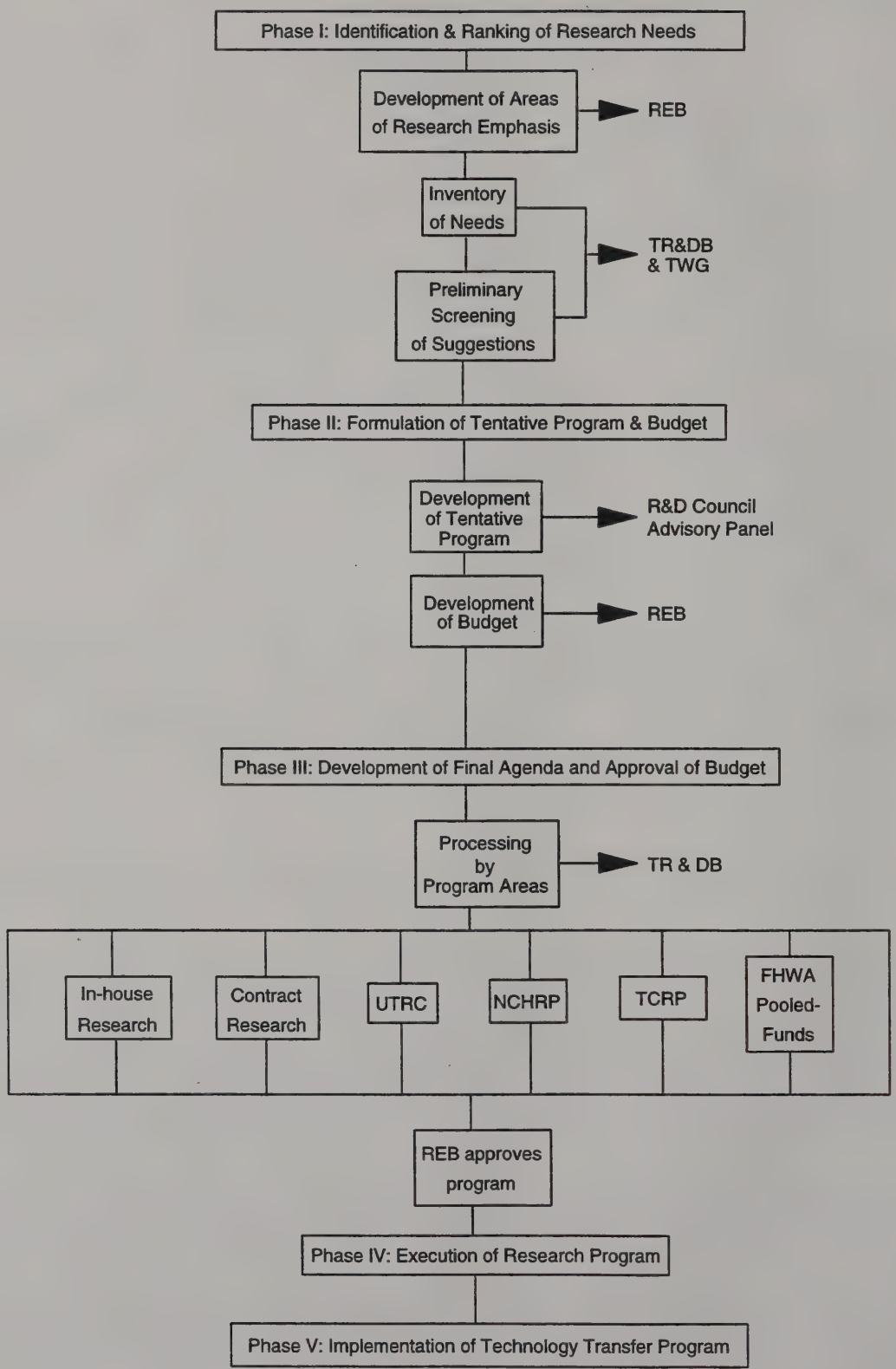
TR&DB is a formally structured research organization having all essential ingredients to launch a successful coordinated Department-wide research program. It has a) a staff of 40+ skilled employees already assigned full-time responsibility for TR&D activities, b) a technical library with access to varied library resources, and to computer-based information services (TRIS, RAC, DIALOG, etc.), c) access to laboratory/testing facilities throughout the Department, d) access to computer facilities and programming staff, e) professional technical editors/writers for research publications, f) an implementation/technology transfer staff, g) capability to perform and evaluate valid statistical analyses, and h) maintained regular contacts and active cooperative arrangements with national and state research organizations, industry, and universities. Figure 4 is a TR&DB organizational chart.

In light of these capabilities and documented accomplishments in managing existing research programs, TR&DB is considered the best candidate to launch this important initiative. The expanded research program will round out the Bureau's continuing responsibilities in conducting and implementing research.

TR&DB will provide professional secretariat services for the program. Two units will be established within the Bureau to implement the RD&T program -- **the Research Coordinating Group (RCG) and the Technology Transfer Team (T2**

Team). Staff will be comprised of the Bureau's existing T2 specialists. The units will be supervised by the TR&DB Director. Liaison representation from FHWA will assist the T2 Team.

Figure 5. Tentative research program cycle.



THE RD&T WORK PROGRAM

This section describes the programming process and program operational procedures. Figure 5 shows the annual RD&T program cycle, Figure 6 the schedule of program activities, and Figure 7 maps the progress of research ideas from conception through delivery of final products to benefit the Department and enhance its operations.

Phase I: Identification and Ranking of Research Needs

1. Develop Areas of Research Emphasis

   REB develops and assigns research emphasis areas (i.e., high-priority subjects). These subjects are primary criteria for project selection.

2. Inventory Research Needs

   TR&DB staff solicits research suggestions from NYSDOT employees, industry, and academia, and surveys strategic research needs from AP and RDC. This involves individual and collective brainstorming -- the Panel and Council complete survey forms and meet to discuss further research needs.

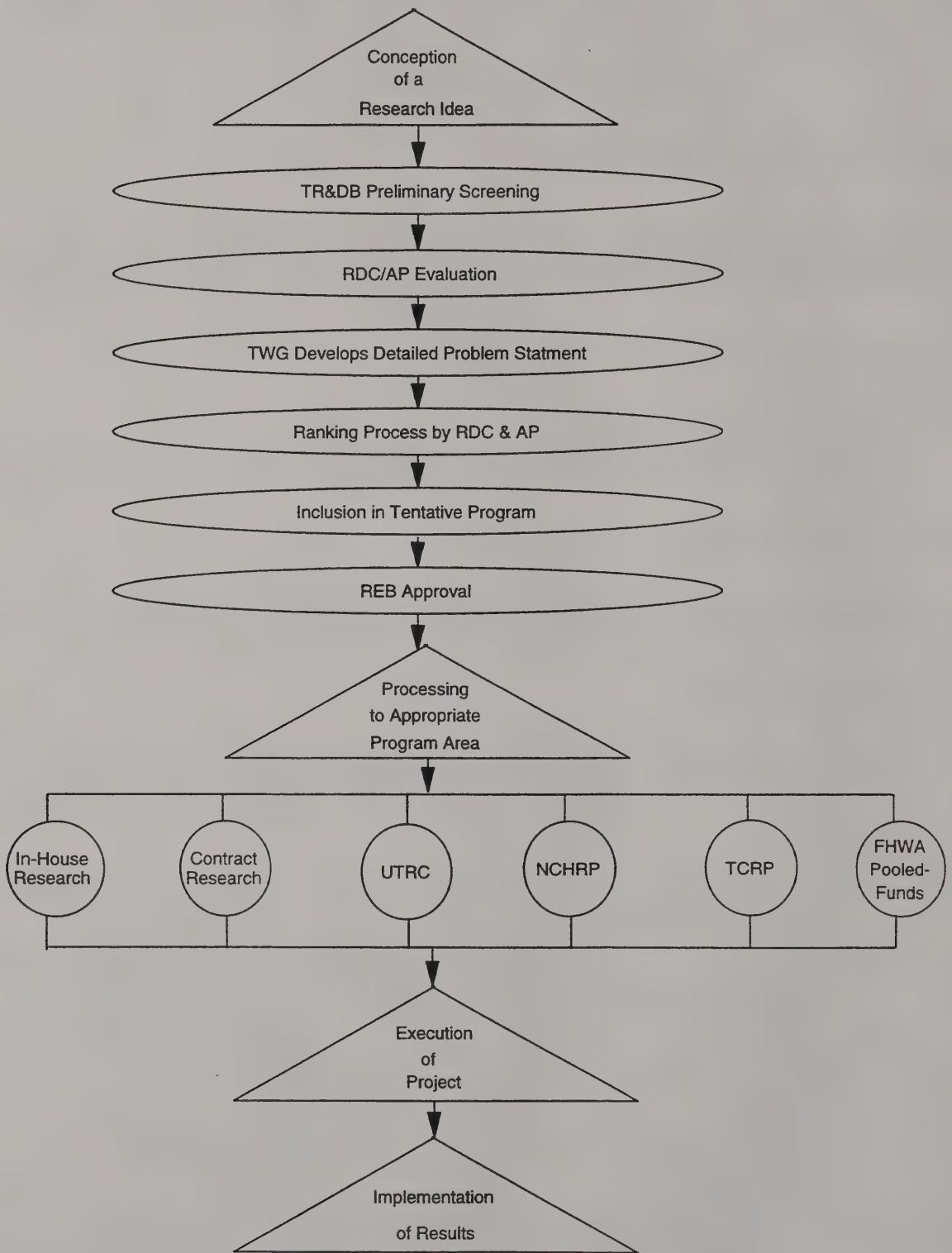
3. Screen Research Suggestions

   TWG members are appointed. In coordination with these designated TWGs, TR&DB initially screens research suggestions (including literature reviews to rule out repetition and/or duplication), classifies candidate problems, and develops first-stage problem statements for potential projects. Research suggestions are examined to

Figure 6. RD&T annual program schedule.

PHASE	ACTIVITY IDENTIFICATION	SCHEDULE Jan. Feb. Mar. Apr.May. Jun. Jul. Aug. Sept. Oct. Nov. Dec.
I	Identification and ranking of research needs.	IIIIIIIIIIIIIIII
II	Formulation of tentative program and budget.	IIIIIIIIIIIIIII
III	Development of final program agenda and approval of expenditure plans.	IIIIIIIIIIIII
IV	Program implementation.	IIIIIIIIIIIIIIIII
V	Technology transfer.	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

Figure 7. Progressing a research project.



determine a) if the problem is important to the Department (it will be evaluated against the emphasis areas established by REB), b) if it is researchable, c) if it is timely, d) whether successful completion will produce significant results, e) whether success is probable, and f) if the study can be designed to avoid undesirable duplication of other completed or ongoing research.

Phase II: Formulation of Tentative Program and Budget

1. Develop Tentative Research Program Content

   Candidate research suggestions, as well as descriptions of proposed NCHRP, TCRP, and FHWA pool-fund studies, are submitted to RDC for consideration in formulating the annual program. Ballots are returned to TR&DB, which compiles ratings and ranks the problems. Balloting is then summarized and sent to RDC, who meet to formulate the program. RDC members vote to select priority research projects that best address NYSDOT needs, and recommend a consolidated program agenda to REB. TR&DB reports the RDC meeting outcome to REB.

2. Formulate Spending Plan and Approve Tentative Program

   REB formulates overall annual spending plan and approves tentative agenda for each program area -- i.e., distributes projects to appropriate research program areas.

Phase III: Development of Final Program Agenda and Approval of Budget

Projects assigned to one of these six program areas are processed as shown in Figure 8.

In-House Research Program

1. TR&DB staff develop scope-of-service for each project and outline a detailed execution schedule.

2. TR&DB submits final program to REB for approval.

3. REB approves program and assigns projects to appropriate personnel within TR&DB for implementation.

Contract Resreach Program

Projects assigned to this program area will be executed by the Department's Research Consortium, composed of ten member universities and other research institutions. Each project will be processed as follows:

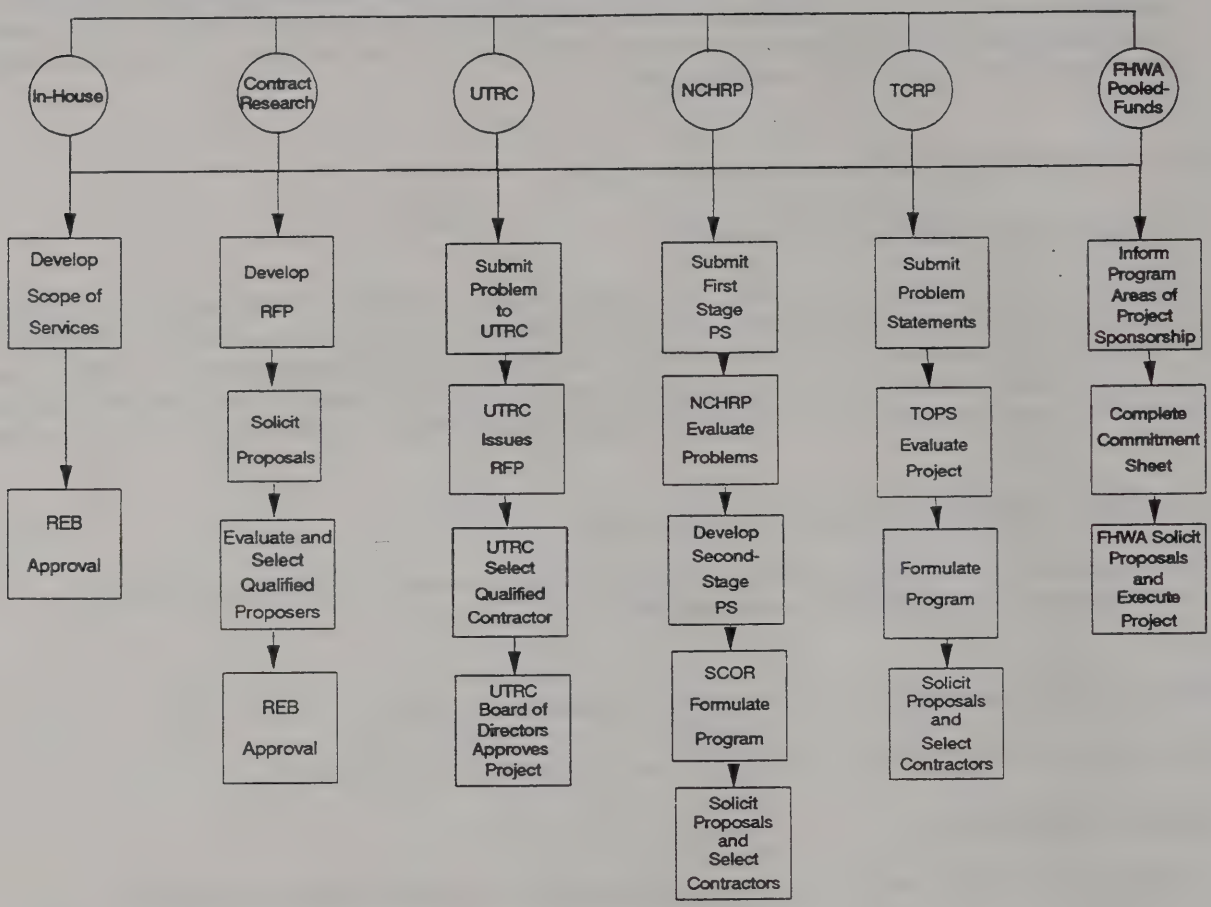
1. Scope of Service for each project selected is developed by the appropriate TWG and forwarded to the Consortium Director.

2. The Director then solicits proposals from Consortium members.

3. The Consortium Steering Committee evaluated proposals and (in coordination with the TR&D Director) selects the best-qualified applicant.

4. Contracts are executed.

Figure 8. Processing a project through program areas.



University Transportation Research Center Program (UTRC)

1. Problem statements are submitted to UTRC.
2. UTRC solicits proposals from participating universities.
3. UTRC's Project Advisory Committee evaluates proposals to select those best addressing NYSDOT's needs.
4. Selected projects are submitted to UTRC's Board of Directors for final approval.
5. Contracts are executed.

National Cooperative Highway Research Program (NCHRP)

1. First-stage problem statements are submitted to the NCHRP staff.
2. NCHRP staff evaluates the problems.
3. Evaluations are forwarded to TR&DB staff.
4. TR&DB in coordination with TWGs develops detailed (second-stage) problem statements for projects surviving NCHRP's early screening process, and submits them to NCHRP.

5. NCHRP compiles and forwards all submitted second-stage problem statements to TR&DB, which disseminates the statements and ballots to the appropriate TWGs. They rate each statement and TR&DB returns them to NCHRP.

6. NCHRP staff compiles submittal to the AASHTO Standing Committee on Research (SCOR), who rate and formulate their program.

7. NCHRP's Executive Committee approve program.

8. Project Panels are designated by NCHRP.

9. Proposals are solicited and research agencies are selected. FHWA and AASHTO approve proposals and contractors.

10. Contracts are executed.

Transit Cooperative Research Program (TCRP)

1. Designated problems are submitted to TCRP.

2. TCRP staff evaluates problems and selects candidate problems.

3. Screening workshops are conducted to evaluate candidate problem statements, and recommended problems are submitted to TCRP Oversight and Project Selection Committee (TOPS).

4. TOPS ranks problems and formulates annual program.

5. TCRP reviews and approves program.

6. Designated Project Panels define scope of study for each project (develop RFPs).

7. Proposals are solicited and contractors selected from agencies submitting proposals.

8. Program is executed.

FHWA Pooled-Funds Program

1. TR&DB informs NYSDOT's affected program areas of RDC's recommendations and REB's approval to sponsor project(s) under national and/or regional pooled-funds programs.

2. Appropriate TWG completes a study-commitment form for each proposed or ongoing project.

3. Responsible agencies designate a state contact person for each study.

4. FHWA solicits proposals and executes contracts.

Phase IV: Execution of the Research Program

1. TR&DB issues a briefing report on program content and funding allocations for each program area.

2. For each project, a project manager is appointed from the assigned TWG.

Table 2. Phase V Implementation of technology transfer program.

IN-HOUSE/ CONTRACT/UTRC	FHWA/ NCHRP/TCRP	ITS	HITEC
1. Evaluate products from NYSDOT-sponsored research. 2. Refine and package technology. 3. Deliver technology. 4. Assist in the implementation.	1. Monitor and report on ongoing and completed studies. 2. Evaluate results and assess applicability. 3. Deliver research outputs to affected agencies. 4. Promote application of outputs.	1. Assist in initiating research and implementing results. 2. Monitor and report ongoing and completed projects in New York and elsewhere, and disseminate results through ITS NEWS newsletter. 3. Assist in training NYSDOT personnel.	1. Monitor program activities. 2. Assess applicability of technology in NYS. 3. Promote application of relevant technology.

3. TR&DB and project managers closely monitor progress reports and progress schedules for all research in progress. Final reports are evaluated by TWGs and TR&DB staff.

Phase V: Implementation of the Technology Transfer Program

Table 2 summarizes T2 tasks. This component is a year-round activity, including dissemination of NYSDOT-sponsored research outputs, primarily carried out by TWG members under direction of TR&DB staff. The T2 component also includes providing support and coordination for four program elements:

FHWA's Internal and Contract Research Programs/NCHRP/TCRP

TR&DB's T2 Team will undertake the following tasks:

1. Closely monitor and report on ongoing and completed FHWA/NCHRP/TCRP projects.

2. Evaluate results and assess their applicability and relevance to New York State.

3. Package research results and deliver to affected agencies.

4. Promote application of results, in coordination with FHWA liaison representative(s).

ITS "New York Moves" Program

In a study dated February 1994, investigating impact of intelligent transportation systems (ITS) on Traffic Engineering and Safety Division operations, the Management Systems Bureau strongly recommended TR&DB involvement in NYSDOT's ITS program. They stated that there is "a critical need for applied research for ITS, both to manage the workload of the TE&SD staff and to protect the interests of the Department." They recommended that since "the knowledge, skills and abilities to perform applied research . . . exist in the Engineering Research and Development Bureau," it should provide ITS research services through its existing programs (in-house and contract studies and UTRC). Accordingly, the proposed RD&T program has the following objectives pertaining to the Department's ITS program:

1. Facilitate initiation of needed applied research that tests new ITS products (hardware and software components) and identify the most cost-effective and efficient product(s).

2. Facilitate initiation of quality control and evaluation studies for the ITS program. Evaluation studies should assess functional, economic, social and environmental effectiveness of ITS program elements.

3. Report performance of ongoing and completed ITS projects, and assess applicability to other areas of the state.

4. Monitor and report on ITS programs elsewhere and on FHWA's IDEA research program. TR&DB has begun its new role in support the "New York Moves" program by publishing the ITS NEWS newsletter to promote awareness of New York's ITS activities within the technical community.

5. Assist in training programs to educate NYSDOT personnel involved in ITS implementation.

Coordination between the "New York Moves" program and the RD&T program rests on the belief that investments in costly new technology should result from solid research and analysis. Additionally, policy must take into account not only cutting-edge technology, but smaller-scale improvements that may be sufficient in some situations.

Highway Innovative Technology Evaluation Center (HITEC)

TR&DB's T2 Team will 1) closely monitor HITEC's activities, 2) evaluate and assess applicability of resulting technology to New York State's environment, 3) promote application of relevant technology, and 4) advise staff of opportunities to serve on expert panels. NYSDOT involvement in this work is imperative to keep pace with rapid changes and new technologies having potential to increase NYSDOT's productivity.

CONCLUSION

The 1990s mark the beginning of a new era for transportation agencies -- the ways that issues have been viewed in the past are being challenged and changed. Old techniques of building infrastructure, concentrating on basic needs, and satisfying regulatory requirements are no longer adequate in addressing the future of New York's transportation system. NYSDOT's effectiveness in meeting new goals will depend on ability to adapt to new realities. Forward-looking strategies must emphasize use of innovative ideas and advancing technologies, developed through an effective, comprehensive, Department-wide RD&T program.

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